BERRY ELECTRONICS

# MODEL 312A L2 TRUNK TEST SET AND MODEL 312A L3 POSITIVE SLEEVE CURRENT ADAPTER

## OPERATING MANUAL

Berry Electronics Incorporated 719 Swift Street Santa Cruz California 95060

# MODEL 312A L2 TRUNK TEST SET AND MODEL 312A L3 POSITIVE SLEEVE CURRENT ADAPTER

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## 1. GENERAL

### A. Scope of the Manual

**1.01** This manual describes the features, operation, and maintenance of the Model 312A L2 Trunk Test Set. Application information and detailed testing procedures are also included. A brief description of Multifrequency (MF) and Dial Pulse (DP) signaling systems are furnished as an aid to understanding and using the Model 312A L2 Trunk Test Set. It also describes the features and operation of the Model 312A L3 Positive Sleeve Current Adapter. Detailed testing procedures with and without the Model 312A L3 Adapter are included.

**1.02** This manual is reissued to add the Model 312A L3 Positive Sleeve Current Adapter test features and test procedures.

**1.03** Terms, Abbreviations and Acronyms used in this publication are listed in Table A.

### B. Applications

**1.04** The Model 312A L2 Trunk Test Set is a portable Multifrequency (MF) and Dial Pulse (DP) sender with High-Low sleeve current control for testing 2-wire trunks and trunk equipment. It is used to furnish address and supervisory signals and provides a means to monitor and communicate on the trunk being tested.

**1.05** The Model 312A L2 provides the following features:

- Access either MF or DP circuits
- Monitor tip and ring battery and ground on the ring
- Control sleeve current
- Access for external test sets
- Audio monitoring and communication over test trunks
- ON-HOOK/OFF-HOOK control

**1.06** The 312A L2 furnishes an interface between the trunk being tested and the test equipment connected to it. It also provides the necessary signaling and control features to access and signal a designated test number. The 312A L2 may be used to test:

- No Test Trunk circuits
- Main Distributing Frame Test Trunks (MDF)
- Test Trunk Ringing circuits (TTRC)
- Pair-Gain Test Controller circuits (PGTC)
- TOUCH-TONE* Frequency Test Applique circuits (TTFA)
- Automatic Intercept Trunks (AIS)
- Inter and Intra Office Trunks
- Incoming and Outgoing Trunk Equipment
- Incoming and Outgoing PBX Trunks

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**TABLE A**
**TERMS, ABBREVIATIONS AND ACRONYMS**

| | |
|---|---|
| AIS | Automatic Intercept System |
| CAMA | Centralized Automatic Message Accounting |
| CCITT | Consultative Committee on International Telegraph and Telephone |
| DF | Distribution Frame |
| DP | Dial Pulse |
| ERL | Echo Return Loss |
| IPM | Impulses Per Minute |
| LED | Light Emitting Diode |
| LTF | Loop Testing Frame |
| MDF | Main Distributing Frame |
| MLT | Mechanized Loop Testing |
| MF | Multifrequency |
| NMS | Noise Measuring Set |
| PGTC | Pair-Gain Test Controller Circuits |
| PPS | Pulses Per Second |
| TMS | Transmission Measuring Set |
| TN | Test Number |
| TRS | Tip (T) Ring (R) Sleeve (S) |
| TSP | Traffic Service Position |
| TSPS | Traffic Service Position System |
| TTRC | Test Trunk Ringing Circuit |

**1.06** Continued
- CAMA Trunks
- TSPS Trunks
- Associated Trunk Facilities**

**When connected to a Loop Testing Frame (LTF) equipped with Mechanized Loop Testing (MLT-1) or Loop Testing System (LTS) contained in (MLT-2).

**1.07** A "Test Trunk" is any of the following:
- No-test trunk
- No-test trunk circuit
- Incoming test trunk
- Test train

**1.08** The Model 312A L2 Trunk Test Set applications include:
- Test incoming trunks for reversal and completion
- Test incoming registers (MF and DP)
- Test outgoing trunks at the OGT frame
- Access "No Test" trunks
- Qualify "No Test" trunks for MLT application

**1.09** The Model 312A L3 Adapter provides additional test features to enhance the testing capability of the Model 312A L2 Trunk Test Set. The L3 Adapter is required for the complete testing of MLT-1/2 test trunks and associated control office trunks.

**1.10** The Model 312A L3 Adapter provides the following features:
- Positive sleeve current control switches.
- Applies battery to the tip and ring or positive battery to the tip of the test trunk.
- Conveniently connects to the Model 312A L2 Trunk Test Set.

**1.11** The additional test applications available when using the Model 312A L3 Adapter with the Model 312A L2 Trunk Test Set are:
- A SLC-96 Channel Test.
- SXS Permanent Signal Release Test.
- Test Trunk Ringing Circuit Control.
- TOUCH-TONE Applique circuit tests (MLT-2 No Test Trunks only).

**1.12** For MLT applications the Model 312A L2 is functionally equivalent to the Western Electric KS-22475 and the Model 312A L3 Adapter is equivalent to the Western Electric KS-22475 L2 Adapter.

**C. Specifications**

**1.13** Specifications of the Model 312A L2 Trunk Test Set are shown in Table B. The specifications for the Model 312A L3 Adapter are listed at the bottom of Table B.

**2. DESCRIPTION**

**A. General**

**2.01** The 312A L2 Trunk Test Set furnishes MF (Multifrequency) and DP (Dial Pulse) address signals for testing 2-wire trunks, trunk equipment and subscriber loops. It also provides High-Low sleeve current control and jack access for external test sets. The 312A L3 Adapter provides additional test capability to the 312A L2 Trunk Test Set.

**2.02** A photo of the 312A L2 is shown in Figure 1. The 312A L2 is a portable test set with a carrying strap attached and a test cord storage area in the cover of the set. A photo of the 312A L3 Adapter is shown in Figure 1A. When not in use, the L3 Adapter fits into the cover of the 312A L2 Trunk Test Set.

**TABLE B**
**SPECIFICATIONS**

| | |
|---|---|
| **Multifrequency (MF)** | |
| Output Frequencies | Standard MF; 700, 900, 1100, 1300, 1500, and 1700 Hz. |
| Codes Generated | 1 2 3 4 5<br>6 7 8 9 0<br>KP ST STP ST2P ST3P |
| Frequency Accuracy | Controlled by quartz crystal. Divide ratio accuracy typically within .2%; worst case divide ratio is within .5%. |
| Frequency Stability | Better than .01%. |
| Output Level | −6 dBm per tone ±.5 dBm. |
| Harmonic Distortion | Less than 1%. |
| **Dial Pulse (DP)** | |
| Rotary Dial | 10 pulses per second at 61.5% break. |
| Output Impedance (while sending) | 600 ohms balanced. (300-4000 Hz) |
| Terminating Impedance (while receiving) | 600 ohms balanced. (300-4000 Hz) |
| Sleeve Current Control | High 28mA: Low 14mA ±3%. |
| Sleeve Resistance Range | 0 to 3200 ohms (at 14mA ±3%). |
| Monitor Speaker Sensitivity | Useful to −40 dBm. |
| **Power Requirements** | |
| Input Power | −20 Vdc to −60 Vdc.<br>−46 Vdc to −60 Vdc for full sleeve resistance range. |
| Current Requirements | Approximately 100 mA. |
| Internal Batteries | 10 Eveready No. E95 Alkaline D cells NEDA 13A or equivalent. |
| **Environmental** | |
| Ambient Temperature | +32° to +140°F (0° to +60° C). |
| Relative Humidity | 0 to 90%. No condensation. |

**TABLE B Continued**

| | |
|---|---|
| **Mechanical** | |
| Dimensions (H×W×D) | 6.0 × 9.0 × 6.0 inches.<br>15.2 × 22.9 × 15.2 centimeters. |
| Weight | 9 Lbs. (4.1 Kgs). |
| Circuit Access | 310 jack or 5 way binding posts. |
| Controls | VOLUME, ROTARY DIAL, KEYPAD, CONTROL OFF-HOOK/ON-HOOK, SLEEVE CLOSED/OPEN, CURRENT HIGH/LOW. |
| Indicators | POWER, BAT ON TIP, BAT ON RING, GRD ON RING, CURRENT. |
| **L3 Adapter** | |
| Impedance | Same as 312A L2. |
| Sleeve Current | High +28mA: Low +14mA. |
| Control Tip & Ring Battery | Through 240 ohms. |
| Control Tip Battery | +116Vdc through 8K resistance |
| Power Requirements | Same as 312A L2. |
| Environmental | Same as 312A L2. |
| **Mechanical** | |
| Dimensions (H×W×D) | 4.7 × 5.5 × 1.2 inches.<br>11.9 × 12.9 × 3.1 cm). |
| Weight | 1/2 lb. (23 Kg). |
| Circuit Access | 5-way binding posts. |
| Controls | +CURRENT HIGH/LOW, +SLEEVE CLOSED/OPEN, PS RLS, SLC. |
| Indicators | CURRENT. |

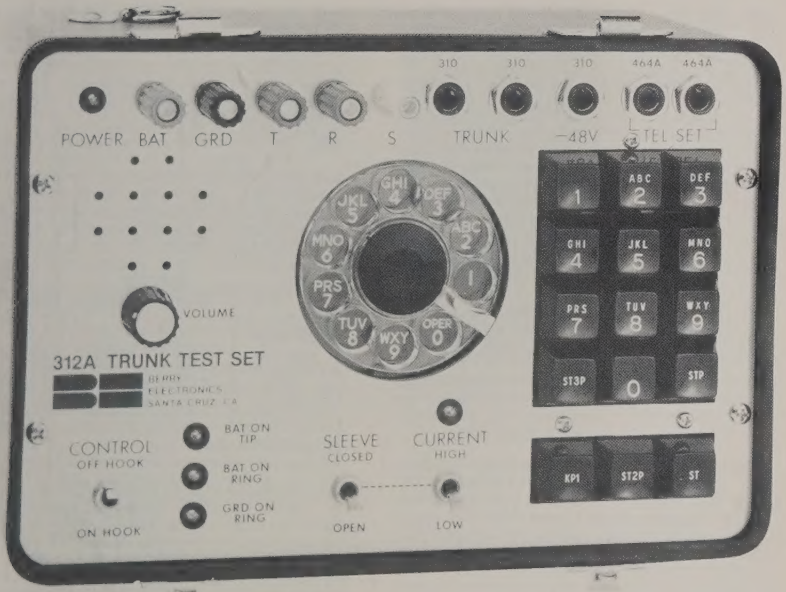



Figure 1. 312A L2 Trunk Test Set

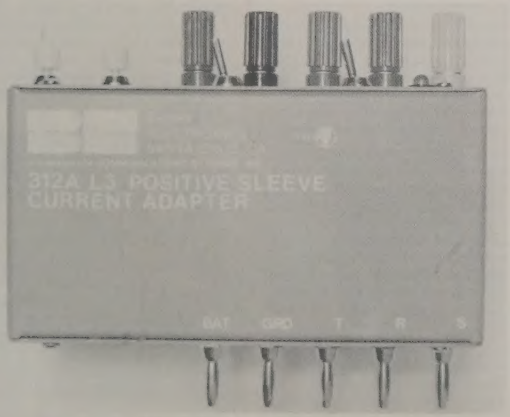



Figure 1A. 312A L3 Positive Sleeve Current Adapter

**2.03** The 312A L2 may be powered from either an internal or external battery supply. When it is powered from central office battery, -48 Vdc is connected to the -48V 310 jack or the color coded BAT and GRD binding posts on the front panel. If sleeve control is not required the set can be powered from a -24 Vdc power source. The POWER indicator LED will light when the set is energized. An internal battery supply is provided for user convenience when central office battery is not available. When the set is powered from its own battery supply it is energized when the CONTROL switch is in the OFF-HOOK position. When the test set is not in use it should be turned off (ON-HOOK position) to conserve the batteries. The sleeve current control function is not available when the set is being powered by its own batteries.

**2.04** In the MF signaling mode, MF tones from the KEYPAD are generated in the standard 2 of 6 frequency format for digits 1 through 0, plus some special codes, that are listed in Table D. The MF frequencies are digitally generated from a crystal time base to insure long term accuracy and stability. The rotary dial provides standard loop dial pulses at a rate of 10 pulses per second at 61.5% break.

**2.05** There are two convenient methods available for connecting the trunk to be tested and external test sets to the 312A L2. Either the two parallel connected TRUNK jacks or the T, R and S binding posts may be used for this purpose. The type of tests being made and the external test set used, will determine how these three access points are to be used. This feature is useful in transmission and noise testing where the 312A L2 is used to outpulse a test line number for a test tone, or quiet termination and the external test set is connected in parallel to make the measurements.

**2.06** The 312A L2 Trunk Test Set connection to the trunk being tested is made through the CONTROL switch. With this switch in the OFF-HOOK position, the trunk is connected to the test set and loop current will be drawn if battery is present. With the CONTROL switch in the ON-HOOK position the test set is not connected to the trunk being tested.

**2.07** Either the 312A L2 or an external test set may provide a termination for the trunk being tested. If a bridging type external test set is used, the 312A L2 provides a 600 ohm termination with the CONTROL switch in the OFF-HOOK position. If the external test set has its own built-in termination, it then provides the termination necessary to hold-up the trunk being tested. The CONTROL switch in this case should be placed in the ON-HOOK position after outpulsing to prevent a double termination on the trunk being tested.

**2.08** Three front panel LED indicators designated BAT ON TIP, BAT ON RING and GRD ON RING display the trunk under test supervision status. They provide a visual display of a sequence of alternating tip and ring signals occurring within a specific time duration that are used to convey address information and call progress.

**2.09** The SLEEVE CURRENT control circuit, in the 312A L2, is a constant current sink that is connected to the sleeve of the trunk being tested when the SLEEVE switch is in the CLOSED position. Either a high or low sleeve current value may be applied to the test trunk. Table C lists the relevant current flow parameters.

**2.10** The 312A L2 has headset jacks for plugging in a headset and communicating over the trunk being tested. Monitoring on the trunk is also provided by a volume controlled amplifier and speaker. If the headset used has an ON/OFF switch, the switch must be in the ON position in order to talk over the trunk under test.

**TABLE C**
**SLEEVE CURRENT PARAMETERS**

| CURRENT SWITCH | VALUE | RMAX | LED ON |
|---|---|---|---|
| LOW | 14 mA | 3200 Ohms | 10 mA |
| HIGH | 28 mA | 1600 Ohms | 20 mA |
| Note: Rmax is the highest resistance for current to be within ±3%. | | | |

**2.11** The Model 312A L3 Adapter plugs directly into the tip, ring sleeve, battery and ground banana jacks of the 312A L2 Trunk Test Set. External devices may be connected to the color coded binding posts or they may be used to connect the −48Vdc office battery supply and the tip, ring and sleeve of the test trunk. The test jacks, in the 312A L2 Trunk Test Set, are wired in parallel with the binding posts, and may also be used for this purpose.

**2.12** The 312A L3 Adapters +CURRENT switch in the HIGH position provides a positive (+28mA) and in the LOW position a positive (+14mA) of constant sleeve current to the test trunk when the +SLEEVE switch is in the closed position. The Adapters CURRENT LED will also light to show positive sleeve current flow.

**2.13** Pushbutton (SLC) provides a positive (+) 116Vdc through 8K ohms of resistance to the tip side of the test trunk. The Adapter also furnishes a 240 ohm battery source to the tip and ring of the test trunk.

**B. Physical Description**

**2.14** The 312A L2 Trunk Test Set is a portable test set equipped with a carrying handle attached to a removable cover. It has a ladder strap attachment for ladder use, and a built-in test cord storage area in the cover. The test cords are not provided as a part of the test set. The Model 312A L2 Trunk Test Set is 6 inches high, 9 inches wide and 6 inches deep (15.2 × 22.9 × 15.2 centimeters). It weighs 9 pounds (4.1 Kgs).

**2.15** The 312A L3 Adapter, when not in use, fits into the cover of the 312A L2 Trunk Test set. The Model 312A L3 is 4.7 inches high, 5.5 inches wide and

1.2 inches deep, (11.9 × 13.9 × 3.0 cm) and weighs 1/2 pound (23 Kg).

**C. Front Panel**

**2.16** The front panel controls, indicators and jacks are shown in Figure 2. The circled callout numbers in the figure correspond with the circled callout numbers in the following text:

(1) POWER red indicator lights when the test set's CONTROL switch is in the OFF-HOOK position and the internal battery supply is used. If the test set is being powered by -48 Vdc, then the set is energized and the POWER indicator lights regardless of the position of the CONTROL switch.

Note: 1. The POWER indicator will not light if the internal batteries are low.

2. Sleeve control is not available when the set is on its internal batteries.

(2) BAT and GRD color coded binding posts for connecting central office battery to the test set. The binding posts are wired in parallel with the -48V jack.

(3) T, R and S color coded binding posts are a user convenience for connecting the trunk to be tested or other external test sets to the 312A L2. The three binding posts are wired in parallel with the two TRUNK jacks.

(4) The two tip, ring and sleeve TRUNK jacks are wired in parallel with the T, R and S binding posts and provide access to the test set for the trunk to be tested and/or for external test sets. Both jacks accept 310 type plugs and standard P2J or equivalent test cords.

(5) The -48V jack accepts a 310 plug with a standard P2J or equivalent cord. It is used to connect the external -48 Vdc power source to the test set. The tip carries the (negative) battery and the sleeve the (positive) ground.

Note: 1. If the sleeve current function is not required, -24 Vdc may be used (ESS office).

2. A plug in the -48V jack disconnects the test set from its internal batteries.

(6) The TEL SET jacks accept WECO type 464A plugs and operate with a standard telephone handset or headset, including WECO 52A, G3, Plantronics Star Set, etc.

(7) Screws at each side of the face panel that must be removed for internal battery maintenance.

(8) Built-in monitor speaker.

(9) VOLUME control knob for adjusting the speaker amplifier to the desired level. Maximum gain is full clockwise.

(10) The CONTROL ON-HOOK/OFF-HOOK switch connects the internal tip and ring of

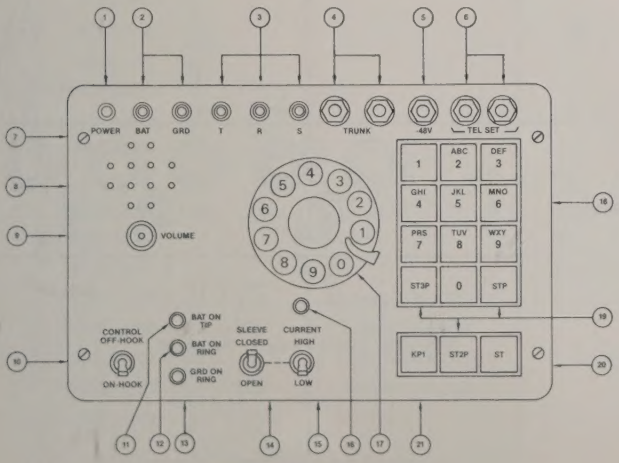



**Figure 2. 312A L2 Front Panel**

the test set to the trunk being tested. In the ON-HOOK position the test set is not connected to the trunk being tested. In the OFF-HOOK position the test set is connected to the test trunk and loop current is drawn if battery is present.

(11) BAT ON TIP red indicator lights when the tip is more negative than the ring.

(12) BAT ON RING red indicator lights when the ring is more negative than the tip.

(13) GRD ON RING green indicator lights when a low resistance ground is on the ring (under 1500 ohms).

(14) The SLEEVE switch in the CLOSED position connects a constant current source to the sleeve of the trunk being tested. In the OPEN position the constant current source is disconnected.

(15) The CURRENT switch provides 28mA of sleeve current in the HIGH position and 14mA in the LOW position.

(16) CURRENT green indicator lights when either high or low sleeve current is flowing. See Table C.

(17) ROTARY DIAL for furnishing Dial Pulse (DP) address signals.

(18) KEYPAD for selecting Multifrequency (MF) address signals.

(19) STP - IDDD request for Directory Assistance Operator (code 12).

ST2P - The same as KP1 except used for non-terminating IDDD calls.

ST3P - CAMA reset signal or International Direct Distance Dialing (IDDD) request for Inward Assistance Operator (code 11).

(20) ST - Indicates the end of MF pulsing.

(21) KP1 - Indicates the beginning of the MF pulsing.

2.17 The top panel of the 312A L3 Adapter is shown in figure 2A. Callouts in the Figure correspond with callouts in the following text.

(1) PS RLS pushbutton applies a 240 ohm battery to the tip and ring of the test trunk.

(2) SLC pushbutton applies a positive (+) 116Vdc (through 8K ohms) to the top side of the test trunk with the ring side open.

(3) T, R, S, BAT and GRD binding posts for connecting 48Vdc office battery and the test trunk or external devices. They are wired in parallel with the 312A L2 Trunk Test Sets similar binding posts and test jacks.

Note: The T,R,S, BAT and GRD plugs at the bottom of the Adapter plug into the similar designated binding posts on the 312A L2 Trunk Test Set.

(4) +SLEEVE switch when in the CLOSED position connects a constant positive (+) current source to the sleeve of the test trunk. It is removed when the switch is in the OPEN position.

(5) +CURRENT switch selects either a HIGH (+28mA) or LOW (+14mA) constant sleeve current source.

(6) +CURRENT LED is illuminated when either HIGH or LOW sleeve current is flowing.

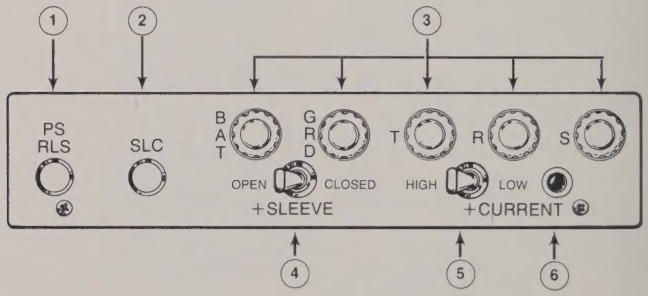



**Figure 2A. 312A L3 Adapter Top Panel**

## 3. OPERATION

### A. General

**3.01** This section provides instructions for using and operating the 312A L2 Trunk Test Set. The operating procedures include a brief description of the tests. Information on the two types of signaling modes employed by the 312A L2 are also presented.

### B. MF Signaling System

**3.02** The MF signaling method uses six frequencies in the voice frequency band. A combination of two of the six frequencies represents a digit. Ten tone combinations are used for the 10 numeric digits (0-9), one combination for the (ST) signal and another for the (KP) signal. The three remaining tone combinations are used to provide other special signals.

**3.03** On intertoll circuits, MF signaling is used to transmit the address information and SF signaling provides the circuit supervision signals. For most MF systems the pulsing rate is between 58 and 75 milliseconds for the pulse and interdigital intervals, or about 7 to 10 digits per second. MF signals are usually transmitted at a -6 or -7 dB level below the circuit voice level. Table D shows the digits and frequencies along with the control function performed by the special codes.

### C. DP Signaling Systems

**3.04** A rotary dial transmits digital information by opening and closing the circuit, which is really a sequence of ON-HOOK/OFF-HOOK signals. The numerical digit dialed is determined by the number of ON-HOOK intervals in the train of pulses. Pulses are usually generated at a rate of 10 per second with a 58 to 64 percent break ratio.

### D. Verification Tests

**3.05** The purpose of the following test procedure is to verify that the 312A L2 Trunk Test Set is in good working order prior to any circuit testing. Make the test by performing the following procedure steps:

1. For internal battery operation, operate the CONTROL switch to OFF-HOOK and the POWER indicator should light. Restore the CONTROL switch to ON-HOOK.

   Note: If central office -48 or -24 Vdc battery is available proceed to step 2. If not, skip step 2, and start with step 3.

2. For external battery operation, connect -48 or -24 Vdc to the -48V jack. Use a patch cord equipped with a 310 type plug with the battery on the tip and ground on the sleeve. The POWER indicator should light when the plug is inserted into the -48V jack.

**TABLE D**
**MF SIGNALING SYSTEM**

| DIGIT OR CONTROL | MF FREQ IN Hz | TSPS | CCITT SYS NO. 5 | EXPANDED INBAND |
|---|---|---|---|---|
| 1 | 700 + 900 | | | |
| 2 | 700 + 1100 | | | Coin Collect |
| 3 | 900 + 1100 | | | |
| 4 | 700 + 1300 | | | |
| 5 | 900 + 1300 | | | |
| 6 | 1100 + 1300 | | | |
| 7 | 700 + 1500 | | | |
| 8 | 900 + 1500 | | | Operator Released |
| 9 | 1100 + 1500 | | | |
| 0 | 1300 + 1500 | | | Operator Attached |
| 11 | 700 + 1700 | ST3P | Inward Operator | Ring Back |
| 12 | 900 + 1700 | STP | Delay Operator | |
| KP | 1100 + 1700 | KP | Terminal Call (KP1) | Coin Return |
| | 1300 + 1700 | ST2P | Transit Call (KP2) | |
| ST | 1500 + 1700 | ST | | Coin Collect<br>Operator Released |

**3.05** Continued

3. At a working telephone set disconnect the telephone from the connecting block. Connect the tip and ring on the connecting block to a TRUNK jack on the312A L2. Use a patch cord equipped with insulated clips on one end and a 310 plug on the other.
4. Insert the 310 plug into a TRUNK jack on the 312A L2.
5. Operate the SLEEVE switch to the OPEN position.
6. Plug a headset into the TEL SET jacks.
7. Operate the CONTROL switch to OFF-HOOK, note that BAT ON RING indicator lights.
8. Dial tone should be heard in the headset and also over the monitor speaker. The VOLUME control should be turned clockwise to increase the volume.
9. Dial a known telephone number with the rotary dial.
10. Audible ringing should be heard. When the called number answers a talking path should now be established.
11. Operate the CONTROL switch to ON-HOOK releasing the called telephone. Disconnect the patch cord from the connecting block and reconnect the telephone set. Remove the 310 plug from the TRUNK jack.
12. The 312A L2 should now be ready for use for trunk testing.

## E. Circuit Testing

### General

**3.06** Circuit access for testing is easiest wherever test jacks are available. Some of the locations having jack access are:

- Outgoing Trunk Test Frame (OGT)
- Testboards
- Switchboards
- Central Office Equipment

**3.07** Most test jacks of the type listed above are normaled through and the circuit will be opened when the jack is plugged into. A monitor jack is bridged across the circuit, and in some cases isolating resistors are also provided. Service on the circuit will not be interrupted when a monitor jack is used for test access.

**3.08** The No Test Trunk Circuit tests are used to check the operability of the test trunk circuits. All circuits should be tested. The tests are best performed at the trunk circuit where the circuit operation can be watched. The 312A L2 Trunk Test Set can be connected directly to the T, R and S of the trunk circuit at the equipment location jacks or at the MDF.

**3.09** Nearly all tests made with the 312A L2 Trunk Test Set require a dial-up test termination. Test terminations are provided in nearly all offices and in many PBXs. The most frequently used in Toll Offices are:

- 100 Balance Test Termination
- 102 1004Hz Milliwatt Test Tone
- 103 Reverse Battery Supervision Signals

These same test terminations appear in many local central offices and PBXs where they are assigned standard 7 digit telephone numbers.

**3.10** The following test procedures are used for testing circuits or equipment using either MF or DP signaling systems.

### Setup Procedures

**3.11** The following describes how battery and ground and the trunk to be tested (T, R and S) are connected to the 312A L2 Trunk Test Set. Before accessing a circuit for test, the following steps must be performed:

1. Connect battery and ground to the test sets -48V jack with a standard P2J or equivalent cord. The POWER indicator should light.
2. If internal batteries are used, operate the CONTROL switch to OFF-HOOK and the POWER indicator should light. Restore CONTROL switch to ON-HOOK. The SLEEVE control function is not available when using the internal battery supply.
3. Verify that the following switches are positioned as indicated:

| Switch | Position |
|---|---|
| CONTROL | ON-HOOK |
| SLEEVE | CLOSED |
| CURRENT | HIGH* |

*Note: Some offices may require the LOW position.

SLEEVE RESISTANCE - Assuming a distant end connection of the SLEEVE to CO GRD, the 312A L2 power source to be CO GRD and -48 Vdc, and the sleeve is connected to the set either by the TRUNK jack or "S" binding post; the 312A L2 can be used to estimate the value of the sleeve resistance. The SLEEVE switch must be in the CLOSED position. Table E lists the values.

**TABLE E**
**SLEEVE RESISTANCE VALUES**

| SWITCH | LED | R SLEEVE |
|---|---|---|
| LOW | OFF | 4500 ohms |
| HIGH | OFF | 2250 ohms |
| HIGH | ON | 2250 ohms |
| Note: The values are accurate to ±10% | | |

4. Connect the T, R and S of the test trunk to one of the TRUNK jacks with a P2B or equivalent cord.

**3.12** Whenever the 312A L3 Adapter is used, make sure that the battery plug of the Adapter is connected to the battery jack of the 312A L2 Trunk Test Set.

Note: Use the T,R,S, BAT and GRD binding posts on the 312A L3 Adapter whenever external devices are required.

**3.13** If a series of tests are to be performed on a number of circuits, these initial set-up procedures must always be established prior to connecting another circuit to the 312A L2.

**C. Circuit Testing Procedures**

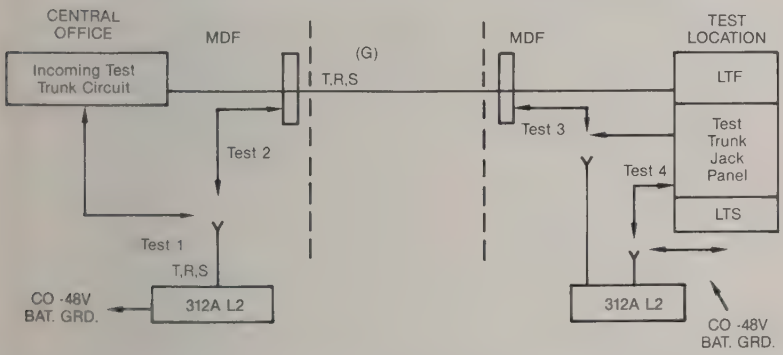
**3.14** The following instructions cover the connections and operation of the 312A L2 Trunk Test Set for typical circuit tests:

(a) Test Procedure 1: Covers the accessing of any test line used for No Test Trunks. The set-up procedures outlined in this procedure cover most No Test Trunks.
(b) Test Procedure 2: Covers the Tone Access Test - 120 IPM.
(c) Test Procedure 3: Covers an Outgoing Trunk Test to a PBX.
(d) Test Procedure 4: Covers the SXS Permanent Signal Release Test.
(e) Test Procedure 5: Covers the SLC-96 Carrier System Channel Test.
(f) Test Procedure 6: Covers the Test Trunk Ringing Circuit.
(g) Test Procedure 7: Covers the TOUCH-TONE Dialing Pad Test.

Note: Test Procedures 4, 5, 6, and 7 require the 312A L3 Adapter.

**TEST PROCEDURE NO. 1**

Typical connecting arrangements for test No Test Trunks with the 312A L2 Trunk Test Set.




Note: Test 1. Used to test for proper circuit operation. The Test Set is connected to the tip, ring and sleeve terminals at the equipment. This test arrangement may be used for new equipment and maintenance purposes.

Test 2 The Test Set is connected at the MDF. This type of arrangement is used to check all trunk circuits in the office from one location without going to each circuit individually.

Test 3 The Test Set is connected to the MDF at the LTF location. All Test Trunks connected to the LTF/LTS can be tested. This configuration used when LTF is not equipped with Test Trunk jacks.

Test 4 The Test Set is connected to the Jack Panel on the LTF/LTS. This provides a convenient testing location for all No-Test and MDF Trunks. (See Note below.)

Note: The Test Set must be isolated from the LTF, ie, T,R,S must be opened along with the G lead between the Test Set and the LTF. This can be done by lifting the jumpers at the MDF. If the G lead is returned to the LTF for grounding, then after it is opened a ground must be placed on the G lead toward the test trunk circuit. If a Test Jack Panel is used at the LTF it is not necessary to open the leads at the MDF. It will be necessary to open the "S" screw (on the TAS) associated with the trunk under test.

## TEST PROCEDURE NO. 1

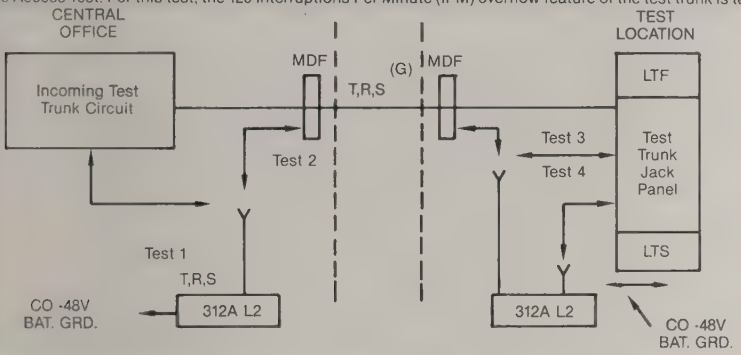
**No Test Trunk testing procedure for operating the 312A L2 Trunk Test Set.**

| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 1. | Perform Steps 1 through 4 in paragraph 3.11 and paragraph 3.12. | POWER lamp lights. |
| 2. | Operate CONTROL switch to OFF-HOOK. | If crossbar (XBar), step-by-step (SXS), DMS-10/100, or No. 3 or No. 5 ESS switch-CURRENT lamp lights.<br>If crossbar, DMS-10/100, or No. 5 ESS switch-BAT ON RING lamp lights momentarily, then BAT ON TIP lamp lights.<br>If step-by-step-BAT ON TIP lamp lights.<br>If dial pulse crossbar-Tone heard during dialing sequence.<br>If test trunk selector circuit (TTSC) used-CURRENT lamp lights.<br>Note: Failure may indicate tip and ring leads are reversed or open. |
| 3. | If Multifrequency (MF) dialing, dial KP1, the steering digit (if required), and the four digits of the test line telephone number and ST. | BAT ON RING lamp lights (except No. 2 ESS switch) and BAT ON TIP lamp extinguished.<br>If No. 1 ESS or No. 2 ESS switch-CURRENT lamp lights after last digit.<br>If No. 3 ESS switch-BAT ON RING lamp flashes once. |
| 4. | If dial pulse (DP) dialing, dial the steering digit (if required) and the four digits of the test line telephone number. | BAT ON RING lamp lights and BAT ON TIP lamp extinguished.<br>If step-by-step-BAT ON TIP remains lit.<br>If TTSC used-CURRENT lamp lights after steering digit is dialed. |
| 5. | Operate CURRENT switch to LOW. | The test set should be cut through to test line telephone number.<br>BAT ON RING lamp extinguished. CURRENT lamp remains lit.<br>If ESS switch trunk calibration telephone number dialed-A 1-second burst of tone may be heard (denied line indication).<br>If No. 5 ESS switch-BAT ON RING lamp extinguished after approximately 6 seconds.<br>If step-by-step-BAT ON TIP lamp extinguished. |
| 6. | Operate CONTROL switch to ON-HOOK. | |
| 7. | Remove 312A L2 Trunk Test Set and reconnect any jumpers disconnected at MDF. | |

Notes: 1. If the test set is located at a step-by-step location and LTF (or LTS) is located at a distant location, dial pulsing may not be accurate due to low resistance of test trunk loop. Add about 300 ohms in series with the ring connection to the test set.

## TEST PROCEDURE NO. 2

Tone Access Test. For this test, the 120 Interruptions Per Minute (IPM) overflow feature of the test trunk is tested



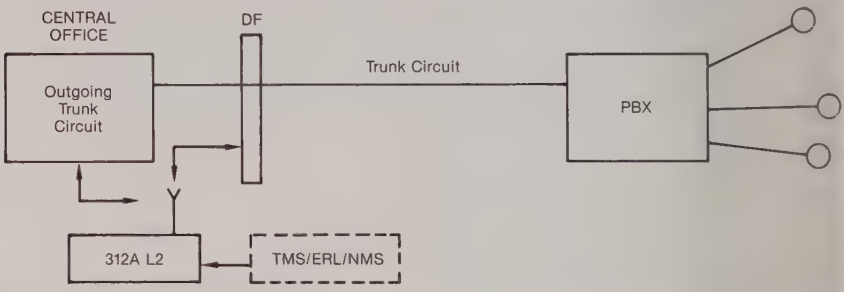

Note See Test Procedure No. 1 for applications under which Test Locations 1, 2, 3 or 4 should be used.

**TEST PROCEDURE NO. 2**

| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 1 | Connect the Test Set as described in paragraph 3.11, steps 1 through 4. | POWER indicator should light. |
| 2 | Connect the T,R and S of test trunk, at one of the 4 test locations shown, to the TRUNK jack. (Disconnect at MDF or connect to test jack on trunk). | |
| 3 | Operate CONTROL switch to OFF-HOOK. | If crossbar, No. 5 ESS switch, or DMS-10/100-CURRENT lamp lights.<br>If crossbar, MDS-10/100, or ESS switch-BAT ON RING lamp lights momentarily, then BAT ON TIP lamp lights. |
| 4 | If multifrequency dialing, dial KP1, steering digit (if required), and ST. (For DMS-10 await timeout.) | CURRENT lamp lights. BAT ON RING lamp lights (except DMS-10).<br>If crossbar-120 IPM tone heard.<br>If DMS-10-120 IPM tone heard. GRD ON RING lamp flashes. |
| 5 | If dial pulse dialing, dial steering digit (if required) and four digits of 120 IPM test line or await timeout after dialing only two digits. | CURRENT lamp lights. BAT ON RING lamp lights.<br>If crossbar-120 IPM tone heard. |
| 6 | Operate CURRENT switch to LOW. | 120 IPM tone heard. GRD ON RING lamp flashes. BAT ON RING lamp extinguished. |
| 7 | Operate CONTROL switch to ON-HOOK. | |
| 8 | Operate CURRENT switch to HIGH. | CURRENT lamp extinguished. Test trunk released. |
| 9 | Disconnect Test Set and reconnect jumpers. | |

## TEST PROCEDURE NO. 3

This procedure covers the test on a PBX trunk from an Outgoing Central Office Trunk Circuit. A balance, (return loss) noise, or transmission test may be made with this test arrangement using External test equipment.




Note: If Trunk Circuit is equipped with jacks the Trunk Test Set should be connected at that point. If it is not, then the T, R and S should be opened at the Distribution Frame and the Trunk Test Set connected at that point

## TEST PROCEDURE NO. 3

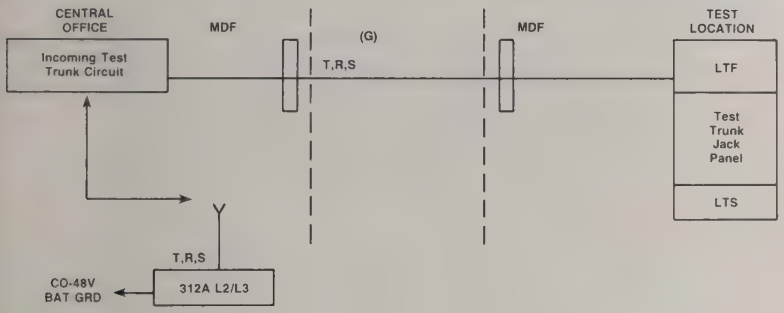
This test is from a Central Office Outgoing Trunk to a PBX. Tests for Transmission and Echo Return Loss are similar.

| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 1. | Connect the trunk test set as described in paragraph 3.11, steps 1 through 4. (Disconnect trunk at DF or connect at test jack on trunk circuit). | POWER light should light. |
| 2. | Operate CONTROL switch to OFF-HOOK. | CURRENT lamp lights. BAT ON RING lights (If reverse battery used).<br>BAT ON TIP lights (If "Wink" Start).<br>BAT ON RING lights for less than 350 msec.<br>BAT ON TIP lights momentarily.<br>BAT ON RING remains lit. |
| 3. | If MF dialing, dial test number (quiet termination). | BAT ON TIP lights. |
| 4. | If DP dialing, dial test number (quiet termination). | BAT ON TIP lights. |
| 5. | For noise test plug external noise test set into TRUNK jack. | |
| 6. | Remove noise test set. | |
| 7. | Disconnect Test Set and reconnect jumpers. | |

Notes: 1. If the Noise Test Set is a Bridging type the CONTROL switch should remain in the OFF-HOOK position. If the set has its own built in termination, the CONTROL switch should be in the ON-HOOK position.

## TEST PROCEDURE NO. 4

This test procedure covers the SXS Permanent Signal Release feature. For this test the "release from dial tone" capability of the permanent signal release circuit will be tested. (Test requires the 312A L3 Adapter).

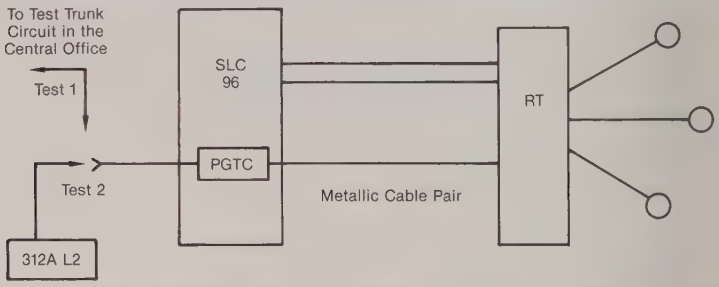



## TEST PROCEDURE NO. 4

| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 1 | Place a 1000-ohm resistor across the T/R of the trunk calibration TN (or a working TN). | |
| 2 | Set up the Test Set and access the TN per instructions in Test Procedure No. 1, steps 1 through 4. | |
| 3 | Operate CURRENT switch to LOW. | Dial Tone heard at TTS. |
| 4 | Operate SLEEVE switch to OPEN. | |
| 5 | At TTS Adapter —<br>Operate permanent signal release (PS RLS) pushbutton for a few seconds. (Until TTS indicator lamps extinguished). | |
| 6 | Operate SLEEVE to CLOSED | If successful dial tone removed. |
| 7 | Operate CONTROL switch to ON-HOOK. | |
| 8 | Operate CURRENT switch to HIGH. | CURRENT lamp extinguished. Test Trunk released. |
| 9 | Repeat Steps 1 through 8 for each test trunk. | |
| 10 | Remove 1000-ohm resistor. | |

## TEST PROCEDURE NO. 5

This test procedure covers the SLC-96 Carrier System Channel test. For this test, the line from the accessed Test Number to the SLC Carrier System Channel unit (in the SLC carrier system channel bank) will be tested. (the test requires the 312A L3 Adapter).




Note: Test 1. Refer to Test Procedure No. 1 for connecting arrangements to use if test is made with CO test trunk circuit.

Test 2. Test may also be made by connecting the Test Set directly to the PGTC of the SLC-96

## TEST PROCEDURE NO. 5

| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 1. | Set up the Test Set and access a SLC-96 carrier TN per instructions in Test Procedure No. 1, steps 1 through 4. | |
| 2. | Operate CURRENT switch to LOW. | |
| 3. | Operate CONTROL switch to ON-HOOK. | |
| 4. | If testing SLC-96 carrier coin TN- Connect R terminal to GRD. | |
| 5. | At 312A L3 Adapter —<br>Operate SLC carrier pushbutton for 1 second. | At pair gain test controller (PGTC) Busy lamp on trunk unit should light. (Verify only if test fails step 8.) |
| 6. | Disconnect R terminal from GRD. | |
| 7. | Operate CONTROL switch to OFF-HOOK. | |
| 8. | Operate SLEEVE switch to OPEN. | Possible tone and lamp responses for good tests (channel OK) are:<br>(a) Single Party BAT ON RING lamp lights and one burst of tone.<br>(b) Multiparty BAT ON TIP lamp lights and two bursts of tone.<br>(c) Coin three bursts of tone.<br>For bad tests (all lines)— GRD ON RING lamp lights, no tone. |
| 9. | Operate SLEEVE switch to CLOSED. | |
| 10. | Operate CONTROL switch to ON-HOOK. | |

**TEST PROCEDURE NO. 5 (Continued)**

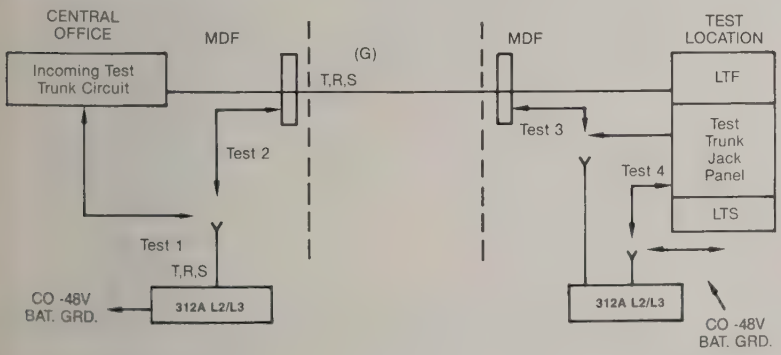
| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 11 | Operate CURRENT switch to HIGH. | CURRENT lamp extinguished. Test trunk released. |
| 12. | Repeat steps for each test trunk. | |
| 13. | Disconnect Test Set and Reconnect jumpers. | |

Note: 1. If ESS office, CURRENT switch may need to be operated from HIGH to LOW to HIGH to release trunk.

2. When the TTS is connected directly to the test trunk ringing circuit (TTRC), it may be necessary to connect a 1000-ohm resistor in series with the sleeve lead. This will prevent the TTS current supply from going into oscilation.

**TEST PROCEDURE NO. 6**

This test procedure covers the Test Trunk Ringing Circuit test. For this test, the test trunk ringing circuit (TTRC) associated with the MLT-2 or no-test trunk will be activated. The ringing and trip capabilities of the TTRC are also tested. (Test requires the 312A L3 Adapter).



**TEST PROCEDURE NO. 6**

| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 1. | Set up the Test Set and access the TN in the office per instructions in Test Procedure No. 1, steps 1 through 4. | |
| 2. | Operate CURRENT to LOW. | |
| 3. | Operate CONTROL switch to ON-HOOK. | |
| 4. | Operate SLEEVE switch to OPEN. | CURRENT lamp extinguished. |
| 5. | At TTS Adapter –<br>Operate + switch to CLOSED. | At TTRC-<br>Relays RC1 and RT1 operate if<br>ESS swtich-<br>Relay T operates in test trunk circuit.<br>At TTS Adapter-<br>+ CURRENT lamp lighted. |
| 6. | Refer to Table F and perform the first applicable test. | Observe-<br>correct ac and dc voltage readings.<br>Correct relay operation.<br>Phone under test rings. |
| 7. | At telephone under test-<br>Lift receiver off hook. | At TTRC-<br>Relay RT momentarily operates and releases.<br>Ring-trip relay, RT1, releases. |
| 8. | Restore receiver on hook. | |
| 9. | Remove short from terminals. | |
| 10. | Repeat Steps 7 through 10 for the remaining tests that apply for the TTRC under test. | |
| 11. | At TTS Adapter -<br>Operate + CURRENT switch to HIGH. | At TTRC-<br>RC1 relay releases. If ESS switch-<br>TT relay operates. |
| 12. | At TTS Adapter-<br>Operate + SLEEVE switch to OPEN | All relays release. At TTS Adapter - + CURRENT lamp extinguished. |
| 13. | Operate SLEEVE switch to CLOSED. | CURRENT lamp lighted. |
| 14. | Operate CURRENT switch to HIGH. | At TTS-<br>CURRENT lamp extinguished.<br>Test Trunk released. |
| 15. | At TTRC serving ESS switch-<br>Inspect PR and PR1 resistors. | Value of 190.2 ohms (18JM) required to MLT-2. |
| 16. | Repeat Steps 1 through 15 for all TTRC's associated with MLT-2 test trunks. | |

Note: When the TTS is connected directly to the test trunk ringing circuit (TTRC), it may be necessary to connect a 1000-ohm resistor in series with the sleeve lead. This will prevent the TTS current supply from going into oscilation.

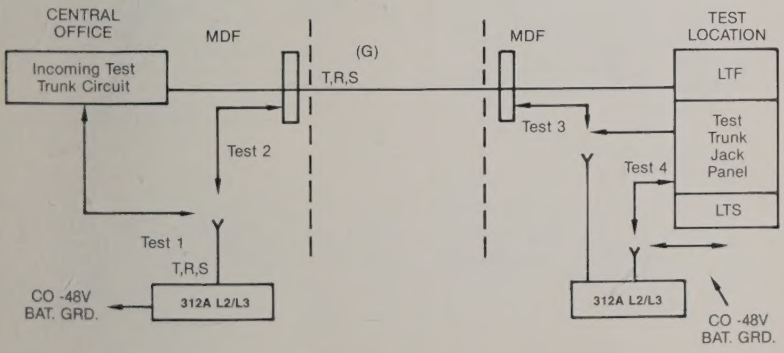
**TABLE F**
**TEST REQUIREMENTS FOR RINGING VOLTAGES**

| TEST | SHORT TERMINALS | METER READING |
|---|---|---|
| SUP− | Applicable | 76 VAC to 107 VAC<br>−35 VDC to −55 VDC |
| SUP− | Applicable | 76 VAC to 107 VAC<br>+35 VDC to +55 VDC |
| SUP+ | Applicable | 76 VAC to 107 VAC<br>+35 VDC to +55 VDC |
| SUP+ | Applicable | 76 VAC to 107 VAC<br>+55 VDC to −55 VDC |
| RAC | Applicable | 76 VAC to 107 VAC<br>−42 VDC to −82 VDC |

Note: If digital voltmeter is used, leads do not require changing. If analog voltmeter is used, the meter leads need to be reversed for all negative voltages. Correct polarity is assumed if dc voltage reading is on scale.

**TEST PROCEDURE NO. 7**

This test procedure covers the TOUCH-TONE Dialing Pad Test (MLT-2 No Test Trunks Only). For this test, the TOUCH-TONE frequency test applique (TTFA) circuit (electromechanical switches) or the TOUCH-TONE dialing test circuitry (in ESS switches) will be activated. (Test requires the 312A L3 Adapter).



## TEST PROCEDURE NO. 7

| STEP | PROCEDURE | VERIFICATION |
|---|---|---|
| 1. | Set up the Test Set and access a TOUCH-TONE telephone in the C.O. per instructions in Test Procedure No. 1, steps 1 through 4. | |
| 2. | Operate the CURRENT switch to LOW. | |
| 3. | At telephone-<br>Remover receiver. | Dial tone not present. |
| 4. | Operate the SLEEVE switch to OPEN. | |
| 5. | At TTS Adapter-<br>Operate the + CURRENT switch to HIGH. | |
| 6. | At TTS Adapter-<br>Operate the + SLEEVE switch to CLOSED. | At TTFA (if Relays TT, TTS, TTA, and SP operate.)<br>(Verify only if test in Step 7 fails.)<br>At telephone-<br>Dial tone heard.<br>At TTS-<br>Dial tone from TT test Circuit heard (all switches). BAT ON RING lamp remains lighted. |
| 7. | At telephone<br>Operate all pushbuttons in sequence 1 through 0. Dial tone will be present during | At TTS-<br>observe audible tones.<br>Verification-<br>If pad OK, two tone beeps will be heard at end of sequence. If pad defective, single (or no) beep will be heard. |
| 8. | Restore telephone to ON-HOOK. | |
| 9. | At TTS-<br>Operate CONTROL switch to ON-HOOK. | |
| 10. | At TTS Adapter -<br>Operate + SLEEVE switch to OPEN. | |
| 11. | Operate CURRENT switch to HIGH. | CURRENT lamp extinguished. Test trunk released. |
| 12. | At TTS-<br>Operate SLEEVE switch to CLOSED. | |
| 13. | Repeat Steps 1 through 12 for each test trunk. | |

Note: When the TTS is connected directly to the Test Trunk Ringing Circuit (TTRC), it may be necessary to connect a 1000-ohm resistor in series with the sleeve lead. This will prevent the TTS current supply from going into oscilation.

## 4. MAINTENANCE

### A. Battery Use

**4.01** The 312A L2 Trunk Test Set is shipped with premium alkaline D cells for long life and reliable operation. Battery life depends on the test set use and it's possible, depending on use, for them to provide a year or more of service. Always turn the test set off (ON-HOOK) when not in use. The (POWER) indicator will not light when the batteries are weak.

**4.02** The batteries can be replaced with any D type cell, however, Berry Electronics recommends Eveready No. E95 alkaline D cells for long life and leak-proof construction.

### B. Battery Removal and Replacement

**4.03** To remove and replace the batteries it is necessary to remove the four front panel screws shown in Figure 2. Next step is to lift the front panel and electronics package from the case. If the rubber gasket is tight, a small screwdriver may help loosen it. Lay the front panel and electronics package down and locate the battery hold-down plate. Remove the four screws holding the plate and remove it. Remove the old batteries and install the replacements. (Correct polarity and battery direction is shown on the battery holder.) Reassemble the test set.

### C. Warranty Information

**4.04** Complete warranty information is contained in the purchase order agreement under terms and conditions of sale. Summarized briefly, all BERRY ELECTRONICS, Inc. products are warranted against defects in materials and workmanship for one year from the date of shipment.

### D. Repairs

**4.05** Any Berry Electronics, Inc. product found to be defective must follow this procedure:

A) Call and request a Material Return Authorization Number (MRA) from Customer Service in Santa Cruz, Calif., 408-429-1857.
B) Select either our Midwest Repair facility (New London, Minn.) or the Santa Cruz facility.
C) Provide a P.O. number.
D) Display the MRA number on the outside of the shipping carton, and all accompanying paper work.
E) Include a brief description of the nature of the problem.

Berry Electronics, Inc. products covered under terms of the above specified warranty will be repaired or replaced at Berry Electronics, Inc. expense. All other repairs will be at the customer's expense. Charges are based on a flat rate schedule.

### E. Returned Material

**4.06** Whenever possible, Berry Electronics, Inc. products being returned for repair should be shipped in the original shipping carton. All instruments must be shipped to the following address:

CSE TECHNOLOGIES
100 W. CENTRAL, P. O. BOX 308
NEW LONDON, MN 56273
1-800-428-9267 • IN MN 612-354-2081
TELEX 852854 NEW LONDON UD
FAX 612-354-2083

**4.07** Equipment (in or out of warranty) when shipped by air freight will be repaired within 24 hours and reshipped air freight. Equipment received by surface freight will be repaired within 10 working days.

A SUBSIDIARY OF COMMUNICATIONS
SYSTEMS, INC.